WHAT IS CLAIMED IS:

1. A method for detecting a phase in a cardiac cycle comprising the steps of:

(a) optically detecting movements of an anatomic structure affected by cardiac activity;

(b) deriving a cardiac signal in response to said optically detected movements which is indicative of a phase in a cardiac cycle; and

(c) generating a trigger signal in response to said derived cardiac signal which is indicative of said phase of the cardiac cycle.

2. The method of claim 1, wherein step (a) is practiced by inserting an optical fiber esophageal probe into an esophagus

3. The method of claim 2, which comprises directing laser light onto a site within the esophagus through at least one optical fiber in the probe, and receiving reflected light from said esophagus site through at least one other optical fiber in the probe.

4. The method of claim 3, which comprises directing said reflected light to a photodetector which derives said cardiac signal therefrom.

5. The method of claim 4, which comprises receiving the derived cardiac signal from said photodetector and generating said trigger signal therefrom.

6. A method of conducting magnetic resonance (MR) microscopy comprising the steps of:

(a) optically detecting internal anatomic physical movement in response to rhythmic periods of cardiac activity and inactivity during a cardiac cycle;

(b) conducting MR microscopy during said periods of cardiac inactivity; and

(c) using the derived cardiac signal to produce cardiac images at specific phases of the cardiac cycle.

7. The method of claim 6, wherein step (a) includes deriving a cardiac signal indicative of said rhythmic periods of cardiac activity and inactivity.

8. The method of claim 7, wherein step (a) further includes generating a trigger signal in response to said derived cardiac signal of said periods of cardiac inactivity.

9. The method of claim 6, wherein step (a) includes generating a trigger signal in response to said optically detected periods of cardiac inactivity.

10. The method of claim 6, wherein step (a) is practiced by inserting an optical fiber esophageal probe into the esophagus

11. The method of claim 10, wherein step (a) is practiced by optically detecting esophageal movements indicative of said periods of cardiac activity and inactivity

12. The method of claim 11, comprising directing laser light onto a site within the esophagus through at least one optical fiber in the probe, and receiving reflected light from said esophagus site through at least one other optical fiber in the probe.

13. The method of claim 12, which comprises directing said reflected light to a photodetector which derives said cardiac signal therefrom.

14. The method of claim 13, which comprises processing the derived cardiac signal by receiving the derived cardiac signal from said photodetector and generating said trigger signal therefrom.

15. A magnetic resonance (MR) microscopy method comprising the steps of:

(a) inserting an optical fiber probe into a vertebrate esophagus;

(b) illuminating a site of the esophagus with light emitted by said probe;

(c) detecting reflected light from the esophagus site by a photodetector coupled optically to said probe;

(d) determining movements of the esophagus at said site indicative of rhythmic periods of cardiac activity and inactivity based on said detected reflected light and generating an output signal therefrom; and

(e) providing said output signal to a MR scanner and synchronizing MR microscopy in response to said detected periods of cardiac inactivity.

16. The method of claim 15, wherein the vertebrate esophagus is the esophagus of a laboratory animal.

17. The method of claim 16, wherein the laboratory animal is a rodent.

18. A gating system for coordinating cardiac activity to a magnetic resonance (MR) imaging pulse, comprising:

(a) an optical probe assembly for optically detecting esophageal movements in response to rhythmic periods of cardiac activity and inactivity;

(b) a photodetector optically coupled to said probe assembly for deriving a cardiac signal in response to said optically detected esophageal movements which is indicative of said rhythmic periods of cardiac activity and inactivity; and

(c) a signal processor which receives said cardiac signal and generates a trigger signal in response to said derived cardiac signal which is indicative of a period of cardiac inactivity.

19. The method of claim 18, wherein the esophageal probe includes at least one pair or optical fibers for directing laser light onto a site within the esophagus, and receiving reflected light from said esophagus site, respectively.

20. The method of claim 19, wherein said photodetector is optically coupled to one of said optical fibers which receives said reflected light from aid esophagus.

21. A magnetic resonance (MR) microscopy system comprising:

(a) an optical detection system for optically detecting physical anatomic movement in response to rhythmic periods of a cardiac cycle and generating a trigger signal during a desired phase of said cardiac cycle; and

(b) a MR scanner which conducts an MR scan pulse in response to receiving said trigger signal.

22. The system of claim 21, wherein said optical detection system includes an optical esophageal probe, and a photodetector optically coupled to said probe.

23. The system of claim 22 which includes a signal processor for generating said trigger signal.

24. The system of claim 22 or 23, wherein the esophageal probe includes at least one pair or optical fibers for directing laser light onto a site within the esophagus, and receiving reflected light from said esophagus site.

25. The system of claim 24, wherein said photodetector is optically coupled to one of said optical fibers which receives said reflected light from aid esophagus.

26. A magnetic resonance (MR) microscopy system comprising:

(a) an optical fiber probe capable of insertion into a vertebrate esophagus;

(b) a light source coupled to said probe for illuminating a site of the esophagus with light emitted by said probe;

(c) a photodetector coupled operatively to said probe for detecting reflected light from the esophagus site, and for determining movements of the esophagus at said site based on said detected reflected light, said photodetector generating an output signal in response to said detected reflected light which is indicative of rhythmic periods of cardiac activity and inactivity; and

(d) a MR scanner which receives said output signal and which conducts MR microscopy in synchronized response to said detected periods of cardiac inactivity.

27. The system of claim 26, which includes a signal processor for generating a trigger signal in response to receiving said output signal indicative of said detected periods of cardiac inactivity.

28. The system of claim 26 or 27, wherein the esophageal probe includes at least one pair or optical fibers for directing light onto a site within the esophagus, and receiving reflected light from said esophagus site.

29. The system of claim 28, wherein said photodetector is optically coupled to one of said optical fibers which receives said reflected light from aid esophagus.

30. The system of claim 26, wherein said light source includes a source of laser light.